CLAIMS

What is claimed is:

1. A spectral reflectance sensor for determining the reflectance of a plant comprising:

a housing;

a light source housed in said housing, said light source projecting light of a predetermined wavelength;

a reflected light receiver including:

a first photodetector positioned to receive reflected light originating from said light source

ambient light compensation means for reducing the effects of ambient light on said first photodetector; and

a first output;

a direct light receiver including:

a second photodetector positioned to receive incident light from said light source; and

a second output;

a discriminator for distinguishing the light originating from said light source and reflected by a plant from ambient light; and

a microprocessor having an input for reading said first output and an input for reading said second output,

wherein the reflectance at said predetermined wavelength is proportional to the quotient of the value of said first output divided by the value of said second output.

2. The spectral reflectance sensor of claim 1 wherein said light source is a first light source and said predetermined wavelength of light is a first predetermined wavelength of light and the reflectance sensor further comprises:

a second light source housed in said housing, said second light source projecting light of a second predetermined wavelength.

3. The spectral reflectance sensor of claim 2 further comprising:

a selector in communication with said microprocessor wherein said microprocessor can select either said first light source to emit light or said second light source to emit light,

wherein said microprocessor can measure the reflectance at said first predetermined wavelength independently of the reflectance at said second predetermined wavelength of light.

4. The spectral reflectance sensor of claim 3 wherein said first light source produces red light of a predetermined wavelength and said second light source produces near infrared light of a predetermined wavelength and wherein said microprocessor calculates

NDVI based on the reflectance computed while red light is emitted and the reflectance computed while near infrared light is emitted.

5. The spectral reflectance sensor of claim 1 wherein said light source is a first light source of a plurality of light sources and each light source of said plurality of light sources produces light at a predetermined wavelength different from the wavelength of each of the other light sources of said plurality of light sources.

6. The spectral reflectance sensor of claim 5 wherein each light source of said plurality of light sources comprises a plurality of light emitting diodes.

7. A normalized difference vegetation index sensor comprising:

a first light source which emits a modulated beam of red light;

a second light source which emits a modulated beam of near infrared light;

a first receiver for receiving reflected light produced by said first light source and said second light source, said receiver having a first output;

a second receiver for receiving incident light from said first light source and said second light source, said second receiver having a second output;

a signal conditioner responsive to the modulation of said modulated beam such that said signal conditioner can discriminate between said first or second light sources and ambient light, said signal conditioner having a first input for

receiving said first output or said second output and said signal conditioner having a third output;

a microprocessor having a second input for receiving the output of said signal conditioner such that said microprocessor can determine the intensity of said first light source, the intensity of said second light source, the intensity of the reflected light received from said first light source; and the intensity of the reflected light received from said second light source,

wherein said microprocessor provides an output indicative of the normalized difference vegetation index calculated from the intensities determined from the signal at said second input.

8. A farming apparatus for precision farming comprising:

a vehicle;

a plurality of variable rate application elements supported by said vehicle; and

a plurality of sensors supported by said vehicle, each of said sensors having a means for determining the nitrogen uptake of a plant and providing an output indicative of the need for mid-growing season nitrogen fertilizer,

wherein for each sensor of said plurality of sensors, there is a corresponding variable rate application element of said plurality of variable rate application elements.

9. A method for applying nitrogen fertilizer using the sensor of claim 1 comprising the steps of:

(a) passing said sensor over an area;

(b) calculating the reflectance of the plant to red light and to near infrared light;

(c) calculating the mid-growing season nitrogen fertilizer requirements from the reflectance calculated in step (b);

(d) setting the rate of application of a variable rate applicator to deliver the amount of nitrogen fertilizer calculated in step (c).

10. A method for synchronizing light emissions from adjacent reflectance sensors in a system having a plurality of reflectance sensors, wherein each sensor emits a modulated beam of light, including the steps of:

(a) providing a network interface on each sensor of the plurality of sensors;

(b) connecting said network interfaces of two or more sensors of the plurality of sensors to form a network;

(c) periodically transmitting a message on said network; and

(d) synchronizing the modulation within each sensor upon receiving said message.

11. A height independent reflectance sensor comprising:

a cylindrical lens;

a light source including a plurality of light emitting diodes configured in a row parallel to, and directed to emit light through, said cylindrical lens to illuminate an area;

a parabolic reflector positioned to receive light reflected from said illuminated area;

a photodetector positioned at the focal point of said parabolic reflector to receive said light reflected from said illuminated area.